PROCEEDINGS OF THE
ROYAL ENTOMOLOGICAL SOCIETY
OF LONDON

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ORDINARY MEETING

WEDNESDAY, 16th JANUARY, 1957, at 5.30 p.m.

AGENDA

1. Confirmation of the Proceedings of the Ordinary Meeting held on 5th December, 1956.
2. Recommendations of candidates for Fellowship. First reading.
3. Recommendations of candidates for Fellowship. Second reading.
4. Announcement of election of new Fellows.
5. Additions to the Library [see p. 47].
6. Nominations of Officers and Council for 1957. Second reading.
7. Admission of Fellows.
8. Exhibits.

Fellows are particularly requested to bring suitable exhibits to the Meeting even though it may not be possible to announce their intention to do so beforehand.

> *Note.*—To avoid congestion in the Library and to enable exhibits to be displayed to greater advantage, a table has been placed in the meeting-room for this purpose. Fellows are asked to place their exhibits on this table, with a suitable explanatory note, as soon as possible on the afternoon of the meeting, so that they are available for inspection there before the meeting opens.

9. Communications.

Dr. C. A. Clarke and **Dr. P. M. Sheppard.**

The genetics of some mimetic forms of *Papilio dardanus* Brown and *Papilio glaucus* Linn.

[Abstract.]

Bates (1862, *Trans. Linn. Soc. Lond.* **23** : 510) suggested that some butterflies obtained protection from their predators by resembling unpalatable or " dangerous " species and therefore being mistaken for them. Müller (1879, *Kosmos, Lwów* **5** : 100) pointed out that it might even be advantageous for two or more protected species to resemble one another. The theory of mimicry is now generally accepted, but little genetic and even less field work has been done on the matter, although the mathematical theories involved have been extensively discussed. Before the evolution of mimicry can properly be understood, it is necessary to accumulate a certain amount of basic genetic data. The present paper reports the results of experimental breeding carried out in this country to determine the method of inheritance of some of the polymorphic forms of *Papilio dardanus* race *cenea* from South Africa, and of *Papilio glaucus* from North Africa.

Part I.

Papilio dardanus race *cenea.*

The early stages of this butterfly were most generously supplied from South Africa by Mr. G. C. Clark, Mr. C. G. C. Dickson, Mr. D. A. Swanepoel and Mr. R. W. Wells, and without their continued co-operation this work could not have been carried out. Using the method of hand-mating and with citrus as food plant, we have been able to breed and analyse 102 families of known parentage in the past two years.

Results.

The difference between the non-mimetic tailless f. *leighi* and the mimic f. *hippocoonides* (model *Amauris niavius dominicanus*) is controlled by a pair of allelomorphs, f. *leighi* being an autosomal dominant. We have been able to confirm that f. *cenea* (model *Amauris albimaculata*) is also an autosomal dominant to f. *hippocoonides*, as was suggested by Ford in 1935. It is not yet certain whether the genes controlling f. *cenea* and f. *leighi* are allelomorphs or are independent. The data suggests, however, that if the allelomorph producing f. *leighi* is present the insect is f. *leighi* regardless of its genetic constitution with respect to f. *cenea* and f. *hippocoonides.*

P. dardanus f. *trophonius* (model *D. chrysippus*) has not yet been investigated.

The relationship of the various polymorphic forms and the evolutionary significance of the non-mimetic form *leighi* will be discussed.

Part II.

Papilio glaucus.

This butterfly has two forms of female. One is yellow and non-mimetic and the other black, mimicking *Battus philenor* (an *aristolochia* feeder), as do *Papilio troilus* and *Papilio polyxenes.* It has been suggested on insufficient evidence that the black form of *P. glaucus*, like the mimetic forms of *dardanus*, is controlled by an autosomal dominant. This is not the case. We have investigated seventy-

three families and in all but six the female offspring were the same colour (black or yellow) as their mother, regardless of the origin of the male. This would suggest that the gene is Y linked or that inheritance is cytoplasmic. However, this view is contradicted by results from the six families, for in these a small proportion of offspring appeared which were unlike their mother in colour. This is inconsistent with total Y linkage and our results are also inconsistent with X linkage. The presence of a recessive in both sexes in some broods and the results from species crosses show that the findings are not due to parthenogenesis with occasional cross-fertilisation. The mode of inheritance of the ground colour therefore remains obscure. However, what is obvious is that there is a "switch mechanism", so necessary in mimicry to avoid the production of intermediate patterns which would be liable to be highly disadvantageous.

EXHIBITS.

The models and mimics of the various butterflies will be shown and also the methods used for breeding *P. dardanus*.

TEA will be served in the Library before the meeting.

NOTICES.

Provision of refreshments after Ordinary Meetings.

The Council of the Society has decided that coffee and biscuits shall be provided in the Society's rooms following Ordinary Meetings. A charge of one shilling per person will be made. Visitors will be welcomed, provided they are introduced and paid for by Fellows.

The serving of refreshments will cease and the house will be closed not later than 60 minutes after the end of the meeting. It will not be possible to keep the Library open during this time and it will therefore continue to be closed at the end of the meeting.

As the number it will be necessary to cater for must be known in advance, Fellows are asked to give prior notice of their intention to stay by signing their names on a list, which will be placed beside the Attendance Book, before 5.30 p.m.

Forthcoming Ordinary Meetings.

Preliminary notice is given below of the principal papers to be read at the next two Ordinary Meetings.

6th February, 1957.

Annual Meeting, including Presidential Address.

6th March, 1957.

(1) **The Hon. Miriam Rothschild.**—Some observations on the Garden Tiger Moth, *Arctia caja* L.

(2) To be arranged.

PROCEEDINGS OF THE ORDINARY MEETING HELD ON 5TH DECEMBER, 1956.

Mr. PAUL FREEMAN, Vice-President, in the Chair.

Present, 68 Fellows and 7 Visitors.

Before the meeting was formally opened the Vice-President announced the recent death of two Honorary Fellows, Dr. Herman Weber of Tübingen, Germany, elected an Honorary Fellow in 1937, and Dr. E. A. Cockayne, elected an Ordinary Fellow in 1904, President in 1943–44, and an Honorary Fellow in 1948.

The Vice-President extended a welcome to Dr. R. H. van Zwaluwenberg of Hawaii, a specialist on the Pacific Elateridae, now working at the British Museum.

The minutes of the Ordinary Meeting held on 7th November were confirmed and signed by the Vice-President.

The names of the following candidates for election were read for the first time: Major Alan Egerton Collier, M.C., B.A.; Mr. John Colin Hartley; Mr. Kenneth Charles Highnam; Mr. Brian John Selman; Mr. Maurice E. Solomon, M.Sc.; and Mr. David Walter Sutcliffe, B.Sc.

For the second time (taken as read): Dr. William F. Barr, Ph.D.; Lt.-Col. William Bowater, R.A.M.C.(Retd.); Mr. Arthur Richard Gittins; Mr. Raymond Uhthoff Kaufmann; Mr. Haikal Riyadh Ra'afat; Dr. Pedrito Silva; Mr. Anthony South, B.Sc.; and Miss Pamela Jean Usher, B.Sc.

The Secretary read the names of the following newly elected Fellows of the Society: Mr. Ram Autar Agarwal, B.Sc., Sugarcane Breeding Institute, Coimbatore, S. India; Mr. Augustine Amechi, c/o Bexley Hospital, Dartford Heath, Bexley, Kent; Mr. Sidney Charles Scarsdale Brown, L.D.S., Stirling Lodge, 142, Richmond Park Road, Bournemouth; Mr. Amar Nath Chattoraj, Department of Zoology, University of Allahabad, India; Mr. Michael Wilson Fox, Heawood, Corbar Road, Buxton, Derbyshire; Mr. Charles Cyril Roy Goodwin, c/o Sir Bruce White, Wolfe Barry & Partners, B.P.T. Railway Manager's Office, Nicol Road, Bombay, 1, India; Mr. Joseph Harold Johnson, 1, Berry Street, Hepthorne Lane, Chesterfield; Miss Anne Dorothy Loubser, Division Plant Control and Quarantine, Rosebank, C.P., South Africa; Miss Olive McCartney, Beechgrove, Kirkpatrick-Durham, by Castle-Douglas, Kirkcudbright; Mr. Amyan Macfadyen, M.A., The Firs, Reynoldston, nr. Swansea, Glamorgan; Mr. John Russel Metcalfe, 35, Pensford Avenue, Kew, Surrey; Mr. James Muspratt, South African Institute for Medical Research, P.O. Box 1038, Johannesburg, Transvaal, South Africa; Mr. Takehiko Nakane, Biological Laboratory, Saikyo University, Shimogamo, Kyoto, Japan; Mr. James Frederick Newman, Meadow View, Eversley Cross, Basingstoke, Hants.; Mr. Abdus Sattar, Agricultural Experiment Station, P.O. Tejgaon, Dacca, East Pakistan; Dr. David Gordon Shappirio, Molteno Institute, University of Cambridge, Downing Street, Cambridge; Mr. Prem Dulare Srivastava, Division of Entomology, Indian Agricultural Research Institute, New Delhi, 12, India; Mr. Tiruvarur Subrahamaniyaiyer Sundaram, Plant Protection Officer, P.O. Cuttack—1, Orissa, India; Dr. Joseph Julius Szent-Ivany, Ph.D., Department of Agriculture, Stock and Fisheries, Port Moresby, Territory of Papua; and Mr. Christopher Wilkinson, Sandbank, Thurlestone, nr. Kingsbridge, S. Devon.

Thanks were voted to donors of gifts to the Library since the last meeting.

The Secretary read for the first time the following names of Fellows nominated by Council to serve as Officers and Council for 1957 :

President : Professor O. W. Richards, M.A., D.Sc.
Treasurer : Dr. N. E. Hickin.
Secretary : Mr. E. B. Britton, M.Sc.
Editor : Mr. W. H. Potts, B.A.

Other Members of Council :

Mr. J. Balfour-Browne, M.A.
Mr. Paul Freeman, M.Sc.
Mr. C. T. Gimingham, O.B.E.
Dr. W. J. Hall, C.M.G., M.C.
Mr. W. V. Harris, M.Sc.
Dr. H. E. Hinton, B.Sc.
Dr. B. M. Hobby, M.A.
Mr. T. G. Howarth, B.E.M.
Dr. H. B. N. Hynes.
Miss D. J. Jackson.
Dr. A. M. Massee, O.B.E.
Mr. H. L. G. Stroyan, M.A.
Dr. H. B. Williams, Q.C.

Alternative nominations, supported by four properly qualified Fellows of the Society, should reach the Secretary before the meeting to be held on 16th January.

Mr. P. J. Smart signed the Obligation Book and was admitted a Fellow of the Society.

The following papers, accepted for publication in the *Transactions*, were read in title :

" Studies in Indian Embioptera. Part I. The Oligotomidae of India ", by K. P. Kapur and M. B. Kripalani.

" The ecology of some Chironomidae (Diptera) in storage reservoirs ", by J. H. Mundie.

" Studies on the reproductive organs of the Heteroptera with a consideration of their bearing on classification", by J. G. Pendergrast.

" The sugarcane Delphacidae and their natural enemies in Mauritius ", by J. R. Williams.

" The Asilidae (Diptera) of the genus *Philodicus* Loew in the Ethiopian region ", by P. Blasdale.

Dr. J. L. Cloudsley-Thompson exhibited and showed lantern slides of some insects from the shore of the Étang de Berre, Bouches-du-Rhône, S. France, taken about 5 km. south of Istres during August, 1956 :

(1) TABANIDAE : Five species were common in the area, of which the three largest, *Tabanus verralli* Oldr., *T. autumnalis* Macq. and *T. rectus*

Loew., were shy and seldom settled long enough to bite. *T. maculicornis* Zett. and *Haematopota lambi* Vill. were the most persistent biters, *H. lambi* especially at dusk and dawn, *T. maculicornis* and *Atylotus agrestis* Wied. (which was less common) during the hotter parts of the day.

(2) *Cicada orni* L., which was extremely numerous on the Mediterranean pine trees.

(3) Carpenter bees, *Xylocopa* sp. : A series from the stem of a reed.

Lantern slides were also shown of the spider *Argiope bruennichi* (Scop.) on its web, showing the stabilimentum.

Dr. H. E. Hinton exhibited :

(1) A slide of the wing nerves of the cockroach stained with methylene blue. He said that, as others had pointed out, it was much easier to stain the nerves if the methylene blue solution was injected under pressure.

(2) A living larva of the beetle *Psephenus lecontei* Lec. which he had collected in Quebec in August. A slide was shown of the tracheal connections of the ventral abdominal gills.

The Hon. Miriam Rothschild exhibited (on behalf of Mr. Charles Lane) the brush organs of the Ruby Tiger Moth (*Phragmatobia fuliginosa* L.), in both the expanded and contracted state.

In commenting on this exhibit, Dr. H. E. Hinton said that the eversible sex-attractant glands of the abdomen of the Arctiidae were everted by blood pressure. The glands consist of modified epidermal cells. The sex-attractant secretion spreads on to the associated hairs and is thus evaporated over an enormous surface area.

Dr. D. B. Long made a short communication on a fungal parasite of the Wheat Bulb Fly (*Leptohylemyia coarctata* Fallén). He said that during the cold wet summer of 1956 adult flies freshly caught in the field were observed subsequently to develop a cystic opening in the ventral surface of the abdomen, the flies dying a few days after the opening first appeared. These cysts were found to be of fungal origin, probably of an *Empusa* species. From the cavity of the cysts fungal nesting bodies were found to be released, the fungus itself apparently sporulating into the body cavity. Within the cages 52 per cent. of all the flies dying in the 14-day period from 21st August to 3rd September were infected with this fungus. The fungus, which was awaiting identification, appeared to have been only once recorded before, in another Anthomyid fly, *Leptohylemyia brassicae,* by Smith in 1927.

Professor O. W. Richards and Dr. H. E. Hinton took part in a brief discussion which followed.

Mr. K. Spencer exhibited ten new species of Agromyzidae (Diptera) from Britain.

Professor O. W. Richards exhibited specimens of *Tracheliodes quinquenotatus* (Jur.) (Sphecoidea), a solitary wasp which preys on ants. The specimens were obtained near Gerona, Spain in August, 1955. The females were attempting to catch workers of *Tapinoma* (Formicidae).

Dr. F. I. van Emden made a short communication on the characters and position of *Graphomyia*. He said that the Muscinae were formerly separated from the rest of the Muscidae by the bend in the *m* vein, and *Graphomyia*, thus, was included in the subfamily. However, this bend was now known in so many unrelated forms, that its use as a subfamily character had to be abandoned. Even within *Graphomyia* it could be developed to a stikingly different degree, e.g. in *G. eustolia* Walk. and *schoutedeni* Villen., which otherwise seem to be identical. It was remarkable that Villeneuve in describing the latter species did not mention the former, although he knew it well. In 1925 Malloch used the broadened lower calyptra for separating the Muscinae, and in dealing with the African forms (1939) he (Dr. van Emden) accepted this character without qualifications. However, Collin (1948) pointed out the relationship of *Polietes* (with straight *m* and narrowed calyptra) with the Muscinae and defined these by the hairy pteropleura—preferably the hairy embossed upper part of the pteropleura—in combination with certain other characters. He suggested a separate subfamily for *Graphomyia* and Fonseca (1956) was inclined to agree with him. The Oriental fauna contained nine genera with a broadened lower calyptra and bare pteropleura. This group could either be defined by the former character and united with the Muscinae or considered a separate intermediate subfamily or amalgamated with the Phaoniini or, lastly, distributed among several groups. Working out the merits of these possibilities, he (Dr. van Emden) found that the last one yielded an obviously very natural classification by placing the various genera where the characters of adults, eggs and larvae fit in best, and where their general appearance clashes least. In this way *Graphomyia* would, rather unexpectedly, join the Limnophorini. This was a most interesting and convincing solution, as, with the exception of the plumose arista, all important characters tally. Moreover, *Graphomyia* and the *Limnophora* group have a strikingly common larval type not found elsewhere in Muscidae; the larvae of *Graphomyia* and many Limnophorini are aquatic and the pattern, headshape and dense pollinosity of *Graphomyia* fits better into this group than into any other.

In the discussion which followed, Dr. H. E. Hinton pointed out that the genus *Limnophora* is most unusual in that the retractor muscles of the posterior pair of prolegs have their most distal insertions behind the apical third of the proleg, whereas in all other dipterous larvae that he had examined the retractor insertions are apical. If the posterior pair of prolegs of *Graphomyia* was found to have similar muscle insertions, Dr. van Emden's conclusions would be supported.

Dr. R. M. Dobson described a new method of studying natural Wheat Bulb Fly populations which had been in use at Rothamsted Experimental Station. The method combined the use of a large field emergence cage with a method of marking and recapture. The cage of terylene netting 24 ft. long × 12 ft. wide and 6 ft. high was erected in an infested wheat field shortly before adult flies were due to appear. Searches were made twice daily and all flies were marked with a spot of paint indicating the date of capture. Marked flies were immediately released and were recaptured at regular intervals. The technique enabled the following to be ascertained :

(1) total number of flies, males and females, emerging from the known area ; this can be related to the numbers of larvae and pupae,

(2) rate of decay of population of both sexes,

(3) structure of population in terms of sex ratios and absolute numbers throughout the life of the adult population.

Lantern slides illustrating the technique were shown.

Dr. P. S. Corbet, Dr. F. I. van Emden, Dr. D. B. Long and the Hon. Miriam Rothschild took part in a short discussion which followed.

Dr. M. I. Crichton demonstrated an insect compressor designed to hold a living insect under the microscope. The insect is gripped between two slides which can be approximated by a fine screw adjustment. The upper slide is arranged so that the head or genitalia of the insect are left exposed for examination and experiment. A full description would appear shortly (*J. R. micr. Soc.* **75**). The compressor was manufactured in the Instrument Workshop of the University of Reading.

Mr. H. D. Swain exhibited a macropterous male form of *Metrioptera brachyptera* L. var. *marginata* Thunb. (Orthoptera : Decticinae) taken in August, 1941, at Wellington College, Berks. This specimen was the first macropterous male to be taken in Britain.

Mr. E. B. Britton exhibited two tins of insects which are on sale as food in the United States. The species were (1) *Oxya japonica* (identified by Dr. V. M. Dirsh), a species of grasshopper which is tinned in Japan and (2) *Aegiala hesperialis*, a lepidopterous larva tinned in Mexico. Both insects are referred to in Bodenheimer's work on *Insects as Human Food.* Dr. H. E. Hinton said that when he was in Mexico City he remembered that a sandwich of the agave borer cost 20 cents, whereas one of chicken in the same restaurant cost only 15 cents.

Mr. A. de Porochin exhibited specimens of *Homaloplia ruricola* Fab. ab. *atrata* Geoffr. (Coleoptera : Melolonthinae) taken at Box Hill, Surrey. He said that this insect has a weak flight, only one or two feet above the ground and for a short period of only one hour from 11.00–12.00 noon on hot bright days, hiding underground the rest of the time. Copulation occurs on bare ground in chalky furrows.

Dr. van Emden said he had found the larva on two occasions in ants nests in the Box Hill area.

Miss Longfield showed a male specimen of *Pantala flavescens* (Fabr.) (Odonata) which had been found flying round the wardroom of H.M.S. Hermes, late in 1955, while on the return voyage from Singapore. This very well-known migrant is a resident of the Old and the New Worlds, in both the tropical and the subtropical belts, but has only once before been recorded from Europe. This was in 1823, from Horning, Norfolk, when one was taken alive by Mr. J. Sparshall, the insect being named *Libellula sparshalli* by J. C. Dale and John Curtis. This specimen was later recognised as an exotic species, now known as *Pantala flavescens* and was removed from the British list. It is now suggested, in view of the assisted passage of the specimen on exhibition, that there is no longer any reason to doubt the record of 1823.

Dr. N. E. Hickin exhibited, on behalf of **Mr. R. C. B. Hartland-Rowe,** a photograph showing a chain of six adult ant-lions which were sitting on a rope hanging from the eaves of his bungalow in Kampala on 15th July. Similar chains were also seen on 23rd July and 21st October. Each individual sits with the fore-legs resting on the tips of the wings of the one above it and the whole row moves as a unit ; when they are disturbed, they all shuffle round simultaneously to the other side of the rope. The first chain was noticed in the morning and at 7.30 p.m. only one individual was left ; at 11 p.m. there were two individuals, one sitting a few inches below the other with its wings spread. The other two chains were collected (except for the ones which escaped) and found to contain one female each. Possibly the formation of these chains had some sexual significance; it would be interesting to hear whether they had been noticed before and whether anyone could confirm that they were associated with courtship. The species had not been identified, but was the common ant-lion around Kampala and bred in large numbers under the bungalow, which is on legs.

E. B. BRITTON, *Honorary Secretary.*

The next meeting (Annual Meeting) will be held on 6th February at 5.30 p.m.

Additions to the Library.

Presented.

Bazyluk, W. *Klucze do oznaczania owadów Polski.* XI *Prostoskrzydle-Orthoptera* (*Saltatoria*). 8vo. Warszawa, 1956. [Nr. 17 serii kluczy.] [Editorial Committee of the Polish Entomological Society.]

Fraser, F. C. *Insectes Odonates Anisoptères.* 8vo. Tananarive, 1956. [*Faune de Madagascar* no. 1.] [Institut de Recherche Scientifique de Madagascar.]

Hesse, A. J. A revision of the Bombyliidae (Diptera) of Southern Africa. Parts II and III. *Ann. S. Afr. Mus.* **35** (1 and 2) : 1956. [The Author.]

Johnston, H. B. *Annotated catalogue of African grasshoppers.* 8vo. Cambridge, 1956. [Anti-Locust Research Centre.]

Kocher, L. Catalogue commenté des Coléoptères du Maroc. Introd. and Fasc. III. *Trav. Inst. Sci. Chérifien* (*Zool.*) **7** and **8**. 1956. [The Publishers.]

Laird, M. *Studies of mosquitoes and freshwater ecology in the South Pacific. Bull. roy. Soc. N.Z.* no. 6. 1956. [Mr. J. Balfour-Browne.]

Talbot, G. *The Fauna of British India. Butterflies.* Vol. II. 2nd ed. 8vo. London, 1947. [Director of Archives, Government of India.]

Théodorides, J. *Contribution à l'étude des parasites et phorétiques de Coléoptères terrestres.* 8vo. Paris, 1955. (Suppl. No. 4 à *Vie et Milieu*) [Dr. A. M. Easton.]

Purchased.

Beier, M. *Revision der Pseudophyllinen.* 8vo. Madrid, 1954.

Belanovskii, D. *Takhiny USSR.* 2 vols. Kiev, 1951, 1953.

Bonne-Wepster, J. *Synopsis of a hundred common non-anopheline mosquitos of the Greater and Lesser Sundas,* etc. 8vo. Amsterdam and London, 1954. [Roy. trop. Inst. Amsterdam Spec. Publ. no. CXI.]

Brinck, P. A revision of the Gyrinidae (Col.) of the Ethiopian Region. 1. 8vo. Lund, 1955. [*Lunds. Univ. Apsskp.* (N.F.) (2) Bd. **51** nr. 16.]

Ceballos, G. Estudios sobre Icneumónidos de España. I and II. 8vo. Madrid, 1924, 1931. [*Trab. Mus. Cienc. nat. Madrid* (*Zool.*) **50, 56.**]

Felt, E. P. *Manual of tree and shrub insects.* 8vo. New York, 1924.

French, R. A. *A handbook of the destructive insects of Victoria.* Vols. 2, 3 and 5. 8vo. Melbourne, 1893, 1900, 1911.

Handschin, E. *Le monde merveilleux des papillons tropicaux.* 4to. Zurich, 1950.

Murayama, J. *Icones of the Scarabaeid-beetles from Manchuria and Korea.* Vol. 1. Fol. Tokyo, 1954. (*In Japanese.*)

Paclt, J. *Biologie de primär flügellosen Insekten.* 8vo. Jena, 1956.

Sjöstedt, Y. Revision der Termiten Afrikas. 3 Monographie. 8vo. Stockholm, 1925. [*K. Svenska VetenskAkad. Handl.* (3) **3.** no. 1.]

Stichel, H. W. *Illustriette Bestimmungstabellen der Wanzen.* II. *Europa.* Hft. 14. 8vo. Berlin-Hermsdorf, 1956.

Thorpe, W. H. *Learning and instinct in animals.* 8vo. London, 1956.

Tigny, F. M. G. T. de *Histoire naturelle des insectes.* 2me éd. 10 Tom. 18mo. Paris, 1813.

Weber, H. *Grundriss der Insektenkunde.* 3 aufl. 4to. Stuttgart, 1954.

In addition, separates have been presented by Mr. R. J. Lever; Dr. J. L. Cloudsley-Thompson; Commander G. W. Harper, R.N.; Dr. T. Karabag; Commonwealth Institute of Entomology; Director, Desert Locust Control, Nairobi; Mr. R. S. George; London School of Hygiene; Smithsonian Institution; Dr. J. J. Steyn; Museo Nacional, Rio de Janiero; Mr. J. C. Bradley; Department of Parasitology, Ontario Research Foundation; Dr. J. T. Salmon; Mr. T. Trought; Dr. D. J. Lewis; Dr. B. R. Stuckenberg; and the Department of Zoology, Birkbeck College.

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